THE FOSSIL COLLECTOR

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Dicroidium dubium (Fiestmantel, 1878) from Middle Triassic Nymboida Coal Measures, New South Wales X 0.7

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John (Jack) Douglas, Palaeobotanist.

2 June 1929 – 6 February, 2007

It is with deep regret that we have to report that Dr Jack Douglas passed away early in February. While few of you would have known him personally, most of you would be aware of his dedication to the recognition and preservation of the Flora Fossil Site – Yea. It was indeed fitting that he lived to see the site officially added to the National Heritage List on January 11th this year. His enthusiasm and readiness to help the amateur collector will be sadly missed. He held the view that the more people looking for new localities and rare specimens the better. His faith in us amateurs acting in a responsible manner was unquestionable – I hope we never let him down.

I personally will miss his help on all things palaeobotanical as is evidenced by his recent revision of the article, "The Baragwanathia Story" (Bulletin 77, January 2006). When he died, he was in the process of writing a few short articles on Victorian fossil plants. It is hoped that, as a tribute to Jack, we will be able to publish the first of these in our next bulletin. At the moment we have the draft but not the essential illustrations. For those of you who would like to know a bit more about Jack's life, there have been several obituaries published, notably in *The Age* (Thursday March 1, 2007, page 20), *The Victorian Naturalist*, (Volume 124(1), February 2007), *The Royal Society of Victoria Newsletter* (Vast, No. 1, April, 2007), and *The Victorian Geologist* (April 2007).

To Jack's wife Anne and their family, our sincere condolences.

Frank Holmes, Secretary/Treasurer.

FUTURE OF THE F. C. C. A.

In our January, 2007, issue of *The Fossil Colector* we enclosed an open letter to subscribers explaining the problems faced by the Association in obtaining articles and re-writing news items for the bulletins, as well as the need to relieve an ancient Secretary/Treasurer.

While, to say the least, we have not been overwhelmed with the response to our letter, we have managed to put together yet another bulletin with the help of Bob and Julie Lake (Queensland) and cuttings from Ross Kitzelmann (Victoria). Hopefully, we will be able to continue for the time being at least, but we still need more help and 'new blood' to guarantee our long term future.

To keep faith with our policy of publishing three bulletins a year, **subscription renewals will be deferred until January, 2008**. The next issue, all being well, will be published in September.

Paul Tierney, Editor.

DARLING DOWNS MEGAFAUNA EXHIBITION

By Ian Sobbe

The F.C.A.A. wishes to thank Cobb & Co., Toowoomba, for permission to use their copyright photographs with this article.

A new exhibition that showcases the fossil heritage of Queensland's Darling Downs has opened at Cobb and Co Museum in Lindsay Street, Toowoomba. Along with an impressive array of Pleistocene megafaunal fossils, the exhibition includes a large lifelike diorama featuring a predation/scavenging sequence typical of life and death during this time. The accompanying plaques give visitors a good insight into the provenance of specimens along with information about individual species. Fossil groups on display include Diprotodontids, Thylacoleonids, Varanids, Meiolanids, Dasyurids, Vombatids, Palorchestids, Macropods and Phascolarcids.

Despite an extremely long history of fossil discovery, this is the first major exhibition to showcase the impressive array of Pleistocene megafaunal fossils found on the Darling Downs in its home area. Darling Downs megafauna were amongst the first fossils officially recorded in Queensland, with the early explorers, including Mitchell and Leichhardt, amassing significant collections in the early 1840's. All of these early collections were studied by Sir Richard Owen at the British Museum, which is still the repository for significant numbers of Queensland and Australian fossils including a number of holotypes. The Queensland Museum was formed in 1862 and then became the modern repository for palaeontological specimens. Much of the early research was conducted by Museum Curator, C.W. de Vis (Curator 1882-1905) who was a prolific writer, contributing 353 articles over a diverse range of natural history subjects.

The Darling Downs faunas have continued to be the subject of intensive research by a broad range of professional and amateur palaeontologists with in excess of 100 species being recorded thus far. Most recently the research focus has shifted to give a better understanding of the palaecology and climatology and place these in a more exacting chronologic framework.

Cobb and Co Museum, the home of the Cobb and Co carriage collection is open for viewing from 10 a.m. to 4 p.m. daily. This exhibition will be in place until February 2008. An entrance fee applies.

Thylacoleo resting in the early morning sun.

Scavenging *Megalania* investigating a dead *Diprotodon*

WELLINGTON CAVES AND THE START OF AUSTRALIAN PALAEONTOLOGY

By Arthur White

The F.C.A.A. is indebted to The Riversleigh Society Inc. for permission to reprint the following article which was first published in their newsletter "Riversleigh Notes" in June, 2006.

Many people driving from Sydney to Dubbo pass the turnoff to Wellington Caves. The turnoff is marked by an artistic tower of metal sculpture that resembles a collision zone between two tractors pulling disc ploughs! However, once you manage to drive past this landmark, the rest of the trip is a journey back through history.

The Wellington Caves were once the most famous fossil locality in Australia and were heralded world-wide for the fossils they contained. European and American museums sent droves of collectors to Wellington in the 1800s so they could obtain some of the caves treasures. So why were the Wellington Caves so important, and what's more are still important?

The caves lie in a band of Devonian limestone (about 400 million years old) that was formed when the eastern coastline of Australia was about where Dubbo is now. Where Wellington is situated would then have been a shallow, warm sea surrounded by reefs. Over the ensuing 400 million years the eastern seaboard was uplifted and the coast began to move eastwards. The buried reefs at Wellington were compressed and transformed into limestone. The surface sediments were eventually worn away by exposure to the elements and acidic rainwater began to etch out holes and fissures in the deeper limestone where caves were beginning to form. In some places the roofs of the caves collapsed creating a huge trap for unwary animals, while elsewhere the caves provided shelter for sick or dying animals. The vast collection of bones at Wellington Caves provide ample evidence of the fauna from the Pliocene (5.3-1.8 mya), the Pleistocene (1.8 million to say 50,000 years ago) and some quite recent fossils (less than 50,000 years old).

The caves were first discovered by white settlers in 1823. A local grazier, George Rankin, reported the presence of caves to the newly-established military outpost at Wellington. Once Rankin entered the caves he instantly found the bones of many and large animals. Some bones were collected and sent to Sydney, where they were quickly forwarded to Professor Jamieson at Edinburgh University in Scotland,

Jamieson being an authority on ancient mammals.

However, the great interest in Wellington Caves was to come later when in the 1830s the great Surveyor General of New South Wales, Thomas Mitchell, was given the task of surveying a road from the Blue Mountains to Wellington. Being an interested naturalist he stopped at the caves and was so taken by the immensity of the fossil deposit that he boxed up a wagon-load of bones and had them sent to Sydney for shipment to London. He did this because there was a great scientific debate raging at the time as to whether all the creatures on the earth were exterminated by Noah's Flood and all of the animals we see today are descendants of the animals that Noah saved on his ark! The scientific community had only just become aware of the value of fossils in this argument, however, the fossils found in Europe were too similar to modern-day animals to help with the debate. At Wellington this was not so, as the cave fossils, while including animals that one could easily recognize (kangaroos, wombats and possums), also included giant beasts and animals that clearly did not survive today. If Noah's flood had covered the earth, surely the kangaroos and possums should be dead along with the other great beasts. The race was now on to investigate the Wellington Caves animals to see if the Great Flood theory held water.

For many years, collectors came to Wellington and transported boxes and boxes of bones back to their respective institutions. The debate was headline news, and Wellington was pivotal in the discussion. It eventually became very clear that the flood had not affected Australia – either Noah's flood was only confined to the middle East and Europe or it didn't happen at all!.

One of the greatest anatomists of the day, Sir Richard Owen, spent over 50 years describing and interpreting the Wellington caves fossils. It was Owen who described many of the enigmatic animals of the past, such as the cow-sized *Diprorodon optatum*, the 'trunked' marsupials such as *Palorchestes*, and the marsupial lion *Thylacoleo*. Owen also coined another expression for the great fossil animals of the Pleistocene – the megafauna.

One of the biggest disappointments with the Wellington Caves fossils was that they were jumbled. There were no complete skeletons, instead there lay a great mixture of bones of many animals all piled together. Later, fossil sites in the Darling Downs and at Lake Callabonna were to

produce entire skeletons of these great animals and so the focus of attention moved away from Wellington.

For many years the fossils were unstudied. A brief period of phosphate mining at Wellington saw some re-collection of fossils (mainly to clear the way for better access to the mine) but it wasn't until 1982, that serious excavation was recommenced. Mike Archer and Mike Augee from the University of New South Wales decided to investigate the cave floor sediments in the Cathedral Cave. Bones of many small animals were found through many layers of the cave floor signalling the discoveries still waiting to be found. From the 1990s to the present, Dr Lyn Dawson and Mike Archer have continued the fossil exploration at Wellington and have found new fossil sites including the Pliocene deposits in the Big Sink. Mike Augee has established a fossil laboratory at Wellington which is also used as a teaching and research institution for young palaeontologists.

The Wellington Caves fauna comprises 38 species of non-flying mammals, of which 10 are extinct. Of the 28 species that are still alive today, very few still inhabit the western slopes of New South Wales, but occur in other parts of Australia. The extinct creatures include the 'Tasmanian' tiger *Thylacinus cyanocephalus*, a giant form of 'Tasmanian' devil, several types of giant kangaroos, *Diprotodon* and *Thylacoleo*. There are also bat bones, reptile remains, small birds and even molluscs present.

IN THE NEWS

QUEENSLAND AMBER DISCOVERY

When fisherman Dale Wicks and his partner Beth Norris went for evening walks on the remote coast of Cape York Peninsula in far north Queensland, they became intrigued by large chunks of strange-looking rock on the beaches. Luckily they decided to send a specimen away for scientific analysis, with astonishing results.

The couple had stumbled across an ancient treasure on the sand – the first amber to be discovered in Australia.* Many of the pieces, some as large as footballs, contain well preserved flies, beetles, spiders, flowers, fungi, moss, fern spores, pollen and even water and air bubbles from a distant past, perhaps as much as 15 million years ago.

Henk Gothelp, a palaeontologist at the University of NSW, who has been studying the amber, considers it to be one of the most significant finds in Australia because of the volumes of information the specimens contain. It will not only reveal the life-forms that flourished in the ancient rainforest, but also the composition of the atmosphere and water at the time the amber was formed. It is also possible some researchers might eventually be able to obtain some DNA from the insect and plant specimens preserved within the amber.

During this year a scientific expedition will look for the source of the amber, the main deposit on land from which the chunks have been eroded and washed into the sea before ending up on the shore. The search will not be easy as it is incredibly remote in this part of Queensland, not to mention the dangers of saltwater crocodiles and submerged reefs.

So far, Mr Wicks, who fishes in the area, and Ms Norris have in three years collected about 60 kilograms of amber which would be worth many thousands of dollars on the Gemstone market. But the couple are keen that the fossils be properly studied first. "They have been incredibly generous by offering the scientific community access," Mr Gothelp said. "This is a great example of the way scientists and the public can work together."

Ms Norris, who is exploring the region with Mr Wicks, has spent a lot of time and effort cutting and polishing the stones to reveal the fossils inside.

The amber was probably formed from the resin of the Kauri pines or a closely related species. It is impossible to know the amber's age without further research, but Mr Gothelp's best guess is around 12 to 15 million years (Middle Miocene).

Information from:
Sydney Morning Herald, December 27, 2006 (Deborah Smith, Science Editor).

* Based on the age of the specimens, this is no doubt correct. However, it is worth noting that a specimen of copal (fossil resin in an intermediate stage of polymerisation and hardening) containing identifiable plant and arthropod remains was discovered at Allendale (north of Ballarat), Victoria, probably in the 1890s, although the locality and date of discovery are not known with any degree of certainty. The specimen's age is considered to be Pliocene or Pleistocene as it is reported to have come from the deep leads below three

flows of basalt. An article titled "The Allendale Resin Specimen: a little known Tertiary fossil from Victoria" was published in *The Fossil Collector* No. 41, September, 1993, with illustrations and references. FCH

TITANOSAUR FOSSILS IN SOUTHWEST QUEENSLAND

Queensland Museum has just announced that bones of the largest dinosaurs yet recorded in Australia have been identified. These were the bones of two Titanosaur sauropods, found by the Mackenzie family on their Eromanga district property in late 2005 and in April last year. Titanosaurs, one of the last remaining sauropod groups in the Cretaceous Period, were the largest animals ever to walk the earth.

Following study and reconstruction by Queensland Museum staff, the fossils were unveiled on May 3 and are now on display at the Queensland Museum exhibition *Museum Zoo*, at South Bank in Brisbane.

The two Titanosaurs have been named "Cooper" and "George", and are believed to belong to a new species of the Titanosaur group that lived more than 95 million years ago. They were plant-eating dinosaurs with very long necks and tails, massive bodies and elephant-like legs. Their fossils have turned up in rocks of a similar age in South America and North Africa, which were also once part of the super-continent of Gondwana.

Queensland Museum Geosciences curator, Scott Hocknull, said that based on the lengths of the humerus of "Cooper'" and the femur of "George", compared to dinosaurs from overseas, the total body length of these dinosaurs is estimated at 24 to 26 m. These bones are only 20-30 cm less than those of the world record-sized Titanosaurs found in Argentina and Africa. "Cooper" and "George" were at least 6-7 m longer than another well-known Queensland sauropod, "Elliot", until now the largest dinosaur found in Australia. "Cooper's" right humerus weighs 100 kg and is a rare complete bone measuring 1.5 m in length.

These important finds are of international significance and, like most dinosaur discoveries in Australia, represent new species. "George" and "Cooper" belong to a different species than "Elliot" and two other sauropods, "Wade" and "Matilda", whose fossilised bones have all been found in the Winton area and are believed to be 2-5 million years younger than those found at Eromanga.

The Mackenzie's Eromanga district property is about 400 km west of Charleville, situated in the very heart of Australia's outback. The fossil-rich sites are part of the Winton Formation, a large sequence of rocks from the age of the dinosaurs known as the Cenomanian Epoch of the mid-Cretaceous Period (approximately 95-98 million years ago) which spans Queensland's interior. At least seven sites have been identified from hundreds of bone fragments since the first fossil was uncovered in 2004. Many more sites are still to be excavated.

Queensland Museum in conjunction with the Cooper/Eromanga Basin Natural History Society which is sponsored by Santos, are currently conducting further excavations at the site.

Many regard this as the start of Australia's dinosaur-rush; something that happened more than 150 years ago in North America and Europe. Australia is now one of the last frontiers for dinosaur discovery and research. These continuing finds are firmly establishing Western Queensland as a destination not only for palaeontologists but also for a growing numbers of palaeo-tourists.

Information from:

www.qm.qld.gov.au/features/dinosaurs/queensland/cooper_george_factsheet.pdf

Artistic representation of a Titanosaur. Photo credit Queensland Museum.

OLDEST TREE SOLVES RIDDLE

The discovery of the world's oldest known tree in the United States is helping solve a riddle that has dogged palaeobotanists for almost a century and a half.

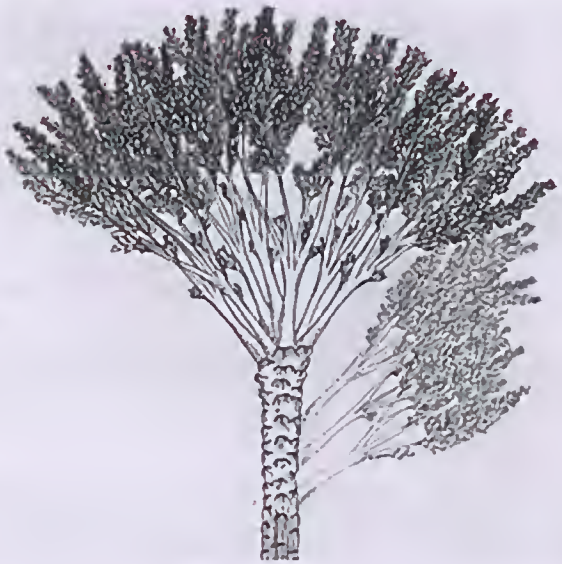
The huge, fossilised palm-like tree is a 380-million-year-old species called *Wattieza*. It was discovered by New York State Museum staff

members Linda VanAller Hernick and Frank Mannolini in a small sandstone quarry in New York in June 2004; a quarry that has already yielded many plant and arthropod fossils.

Their first *Wattieza* find was the 200 kg fossilised crown of a massive tree, and the following year they dug up an 8-metre tree trunk of the same species. This in not the first time pieces of *Wattieza* have been uncovered, but this latest discovery confirms that it has a great similarity to the modern tree fern.

This find provides answers to a puzzle that has dogged palaeobotanists for 137 years and explains how forests gradually shaped Earth's landscape, according to the team's report in *Nature*, the weekly British science journal. These fossils provide the first solid evidence about the shape and size of early trees and could help explain how forests came to dominate the landscape, creating new micro-environments for smaller plants and insects, storing large amounts of carbon and consolidating the soil.

Source ABC:
http://www.abc.net.au/news/newsitems/200704/s1901241.htm



A reconstruction of how the crown portion of Wattieza would have looked in life. Image: Frank Mannolini, New York State Museum.

CAVE FIND RE-IGNITES EXTINCTION DEBATE

The major find of a cache of fossilised prehistoric mammals in caves on the Nullarbor Plain earlier this year has provided science with a spectacular array of species to study. It has also re-ignited debate on the causes of extinction of Australia's megafauna. Altogether 69 fossils of bird, mammal and reptile species were found. These included not only many complete skeletons, but the first complete skeleton of a marsupial lion (see pp.14 & 15), and eight new species of kangaroo.

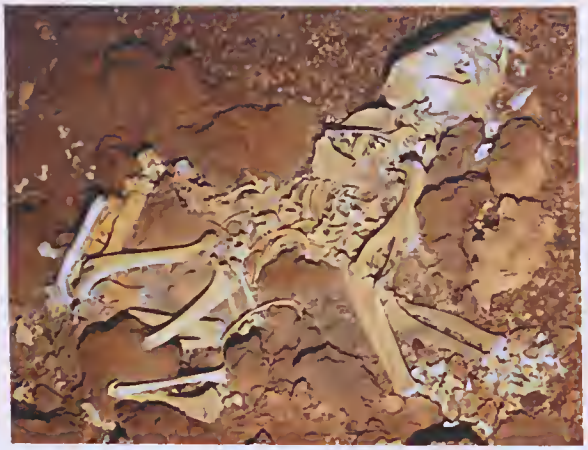
The site was discovered by cavers in 2002, but it then took a Western Australian Museum team led by palaeontologist Garth Prideaux four years to collect and analyse the fossils.

The animals fell into the caves, 20-70 metres below the desert, between 800,000 and 200,000 years ago. Analysis of the oxygen and carbon content of tooth enamel from the fossils of 13 kangaroo species, including several giant kangaroos, and one species of giant wombat, showed similarities to that of kangaroos and wombats living today. This indicated that the fossil animals had also lived in an arid climate. The presence of tree kangaroos among a total of 23 kangaroo species indicates that the Nullarbor once had a much more varied vegetation.

Australian megafauna died out around 45,000 years ago, and this new evidence that they had survived in an arid environment undermines the theory that it was ice-age aridity that caused the extinctions. Instead, it strengthens the view that human hunting and habitat alteration caused the loss of Australia's large fauna.

Writing in the journal *Nature,* Dr Prideaux said the new-found fossils disproved claims that climate change triggered the extinction of the megafauna. According to Dr Prideaux, there's no way you can twist the evidence to say that climate change was responsible, and that leaves only one suspect: *Homo sapiens*. According to team member Dr John Long of Museum Victoria in Melbourne, we are never going to find a diprotodon with a spear in it, but this is as close as you can get to nailing the argument.

Researchers, such as Tim Flannery, have long supported the 'blitzkrieg' hypothesis proposed by US geoscientist Paul Martin that when people first arrived in a new land they hunted their prey to extinction. Others suggested that Aboriginal people not only hunted megafauna, but changed the landscape through firestick management, thus changing



The first known complete skeleton of the 'marsupial lion' *Thylacoleo carnifex* in situ in the Flightstar cave, Nullarbor Plain, Western Australia.

Skeleton after peparation for exhibition in the Western Australian Museum, Perth.

Dr John Long with the skull of *Thylacoleo carnifex*.

PHOTOGRAPHS BY CLAY BRYCE,

Dr Gavin Prideaux excavating a stenurine skull from the floor of the Flighstar Cave, Nullarbor Plain, WA..

Computer-generated image of the 'marsupial lion' *Thylacoleo carnifex*.

Kangaroo bones from a new species of *Baringa* (wallaby) found in the Flightstar Cave, Nullarbor Plain, WA.

WESTERN AUSTRALIAN MUSEUM

the ecosystem .

The WA Museum team claims it has conclusive evidence that before people arrived, animals survived climate swings. They were coping very well, according to team member Professor Bert Roberts, a dating expert at NSW's University of Wollongong. Along with Professor Flannery, Professor Roberts published key evidence from 28 megafauna sites around Australia that pinpointed a continent-wide extinction of large mammals and birds about 46,400 years ago.

Professor Roberts said species always bounced back despite stresses from droughts and difficult conditions. Climatic conditions were good, however, when humans arrived on the scene, but still the megafauna swiftly disappeared. Only humans could have caused the extinctions, he said.

University of NSW palaeontologist Steve Wroe agreed that the new-found fossils were extremely interesting. Yet he disagreed sharply with the claim that humans were the cause, saying you can't nail someone on a murder charge if you don't have a body, weapons or a suspect at the scene.

Also unconvinced is Judith Field of the University of Sydney, who says you can show that a species was arid-adapted 200,000 years ago, but you can't then "extrapolate" to 40,000 years and say humans must have caused the extinctions. She argues that archaeological finds from Cuddie Springs in south-eastern Australia, the only place where human and megafauna remains have been found in the same place, did not show that the animals were hunted. She prefers the theory that different species were driven to extinction at different times in different places by a combination of events, including the stress of the later, more severe ice ages.

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Information and contacts:

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Western Australian Museum
http://www.museum.wa.gov.au/exhibitions/online/thylacoleo/intro.asp

FOSSIL COLLECTORS FIND NEW FISH SPECIES

Late last year South Australian couple Tom and Sharon Hurley revealed the discovery of a100-million-year-old fossil of a previously-unknown fish species. The fossil, found on a trip to Boulia, Queensland, was handed over to the South Australian Museum and later confirmed as a new species by museum research fellow Dr Ben Kear.

The Hurleys, who are members of the Fossil Collectors Association of Australasia, found a wonderfully preserved snout of a fish estimated to be a two-metre long carnivore with large blade-like teeth. It has been described as a cross between a modern-day barracuda and a swordfish and was thought to have been a powerful swimmer.

This new species is believed to be the ancestor of previously-discovered *Protosphyraena*, a large, predatory, carnivorous genus found in Europe and North America. But the new find is estimated to be at least 20 million years older than any specimen of protosphyraena ever uncovered.

At the time when the Hurley's fossil was alive, Australia was effectively the southern polar continent, and the fish was living in the polar ocean, according to Dr Kear. And he believes the Hurleys' find also opens up the possibility of more species waiting to be discovered in the Australian outback.

Dr Kear is in the process of writing a scientific paper on the find which he hopes to publish later this year. His paper will give the species its name and, while this remains closely guarded until publication, it will honour its finders, the Hurleys.

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A GLIDING LIZARD FROM CHINA

Researchers from China have uncovered the remarkably well preserved fossil remains of an ancient lizard that had a wing-like membrane spread over its elongated ribs, a feature that would have helped the lizard glide

through the air.

Xing Xu, and his colleagues from Shenyang Normal University, Peking University, and the Institute of Vertebrate Paleontology and Paleoanthropology in Beijing, discovered the specimen in northeastern China's Liaoning Province, an area that in recent years has yielded a treasure trove of feathered dinosaurs and early fossil bird remains.

The lizard, which has been named *Xianglong zhaoi*, lived in the Early Cretaceous (145-100 million years ago). The specimen is 15.5 centimetres long, including a 9.5 cm tail, and based on its imature features is believed to have died at a young age.

The animal has eight elongated ribs on each side that support a superbly preserved wing-like membrane called a "patagium". Fully expanded, the patagium would have stretched about 11 centimetres.

Xianglong had curved claws that would have enabled it to dwell in treetops, from where it could launch into the air, possibly to catch insect prey. Most gliding animals, such as "flying" frogs, squirrels, and Australia's gliding possums, use a membrane spread between their toes or between their body and legs to stay airborne. A gliding membrane spread between elongated ribs is only known to occur in the fossil record in ancient lizard-like animals that lived between the Late Permian and Late Triassic (260-200 million years ago). Such reptiles have been found in Germany, North America and the United Kingdom.

Sankar Chaterjee, a paleontologist from Texas Tech University in Lubbock, USA, explains that the new discovery is special because *Xianglong*, unlike other Permian and Triassic forms is a true lizard.

The modern day *Draco* lizards in Southeast Asia also have "wings" supported on ribs that help them glide, but according to Robert Carroll, a vertebrate paleontologist at McGill University in Montreal, Canada, it is improbable that the *Draco* lizards are decended from *Xianglong zhaoi*.

What is remarkable is that all these animals developed their gliding abilities independantly – a startling example of nature developing the same useful feature in unrelated species.

Information from on-line articles in:
New Scientist, Live Science, and National Geographic News, March, 2007.

Reference:
Pi-Peng Li, Ke-Qin Gao, Lian-Hai Hou, and Xing Xu, 2007. A gliding lizard from the Early Cretaceous of China. *Proccedings of the National Academy of Sciences* 104(13): 5507-5509.

Artist's interpretation of the lizard's elongated ribs spreading a wing-like membrane for gliding (Credit: Xing Lida).

EMUS TRACK DINOSAUR BEHAVIOUR

Interpretation of the behavioural complexities of extinct animals can be highly speculative, so American palaeontologists have been studying emus in order to help decipher dinosaur trackways. They have found that large, extant, flightless birds can act as proxies for theropod dinosaurs, and the footprints made by emus show strong similarities to the impressions of carnivorous dinosaurs.

Brent Breithaupt, curator and director of the University of Wyoming's geological museum, had been trying to make sense of 165-million-year-old dinosaur footprints at the Red Gulch Dinosaur Track site in northern northern Wyoming. But with no documented dinosaur bones and teeth

from that period for North America, other than some scrappy material from Mexico, it was difficult to connect the tracks to any particular dinosaur.

After searching the dinosaur fossil record worldwide, Breithaupt and his colleagues decided that the Red Gulch tracks were most likely those of a human-sized, meat-eating theropod. Then, instead of speculating about what the dinosaurs might have been doing, they went hunting instead for a modern analog model they could study to decipher the tracks.

Large flightless birds are thought to be descended from dinosaurs, and were the most logical choice. On closer consideration, ostriches have only two toes and an attitude problem, while rheas are difficult to work with. That left emus, which are the right size, walk on two legs, have similar three-toed feet, and are relatively easy to work with. Better still, an emu ranch was situated nearby at which Breithaupt and his team could study the birds. It soon became apparent that many mysterious dinosaur tracks could be quite easily understood by watching a live bird in action.

Researchers had, for example, been puzzled by dinosaur tracks at Red Gulch which sometimes showed a 'crossing-over' pattern – that is, one foot crosses over the other when walking. Emus showed a similar pattern, due to the narrow straddle of their tracks – their legs are very close together – and their habit of frequently stopping in mid-stride to look around, which resulted in crossed foot tracks.

The tracks at both Red Gulch and the emu ranch have been carefully documented using state-of-the-art photogrammetric techniques, which allows detailed sub-millimetre accuracy in photographs. These can be computer-modelled and even made into physical prototypes with rapid phototyping technology.

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STOLEN FOSSIL TRACKS RECOVERED

Fossilised dinosaur footprints stolen from a protected site in the Vale of Glamorgan in South Wales have been recovered from a shop in Lyme Regis, Dorset, after they were advertised for sale on eBay.

The three-toed prints were stolen from the Bendrick Rock site, one of Britain's most important areas for fossil footprints. Senior geologist for the Countryside Council for Wales (CCW), Dr Bill Wimbledon, said the CCW investigated the theft after receiving a tip-off that the fossils were being advertised for sale.

From details given in the advertisement, it was realised these could only have come from Bendrick Rock. The CCW worked with police, and the fossils were recovered after a raid on the Lyme Regis shop.

The theft caused extensive damage to the site. Trackways were broken up, large areas of rock quarried, and prints cut out and removed. Police said a local amateur geologist had been cautioned for criminal damage and theft from a protected site. Dealers involved maintained they had obtained the fossils from legal sources.

It is legal to collect fossils in Britain and to trade them, but not from protected areas.

Information from BBC News:
http://news.bbc.co.uk/1/hi/wales/south_east/5299016.stm

PUSHING BACK THE LIFE-TIME LINE

Evidence is mounting that life on earth appeared as early as 3.8 billion years ago; some 400 million years earlier than previously thought.

It is 10 years since scientists reported evidence for this, in a controversial cover story in the journal *Nature*. Now, a University of California, Los Angeles (UCLA) professor who was not part of that team, and two of the original authors say new research provides stronger-than-ever support for those findings.

Craig E. Manning, lead author of the new study and a professor of geology and geochemistry in the UCLA Department of Earth and Space

Sciences, painstakingly mapped an area on Akilia Island in West Greenland where ancient rocks were discovered that may preserve carbon-isotope evidence for life at the time of their formation. Manning and his co-authors (who were also co-authors of the Nov. 7, 1996, study in *Nature*) T. Mark Harrison, a UCLA professor of geochemistry and professor at the Australian National University; and Stephen J. Mojzsis, assistant professor of geological sciences at the University of Colorado, conducted new geologic and geochemical analysis on these rocks.

This latest paper, published in the American Journal of Science, shows with far greater confidence that these rocks are older than 3.8 billion years, and are appropriate for hosting life. Everything from the basic geology to the analysis in the original report (in *Nature*) has been challenged, according to Manning, including the chemical evidence for life, the minerals to determine whether life was present, and the origins and age of the rocks.

There is still some doubt, however, because after more than 3.8 billion years, the rocks are severely damaged. They have been folded, distorted, heated and compressed so much that their minerals are very different from what they were originally.

The form of life the researchers believe they have discovered was probably a simple microorganism, although its actual shape or nature cannot be ascertained because heat and pressure over time have destroyed any original physical structure of the organisms.The residue of ancient life that the scientists believe they have found existed prior to the end of the late heavy bombardment of the moon by large objects, a period which ended approximately 3.8 billion years ago.

Information from *Science Daily:*
http://www.sciencedaily.com/releases/2006/07/060721090947.htm
Source: UCLA - contact: Stuart Wolpert (swolpert@support.ucla.edu)
Reference:
Craig E. Manning, Stephen J. Mojzsis, and T. Mark Harrison. 2006. Geology, Age and Origin of Supracrustal Rocks at Akilia, West Greenland. *America Journal of Science* 306: 303-366.

PRICKLY CAMBRIAN FROM THE BURGESS SHALE

A new species has been identified from 11 complete fossils of a one-centimetre long, spine-covered creature that lived around 505 million years ago. The tiny slug-like creature was identified by Jean-Bernard Caron of the Royal Ontario Museum in Toronto, Canada and Simon Conway Morris of Cambridge University in England. They named the Cambrian invertebrate *Orthrozanclus reburrus.*

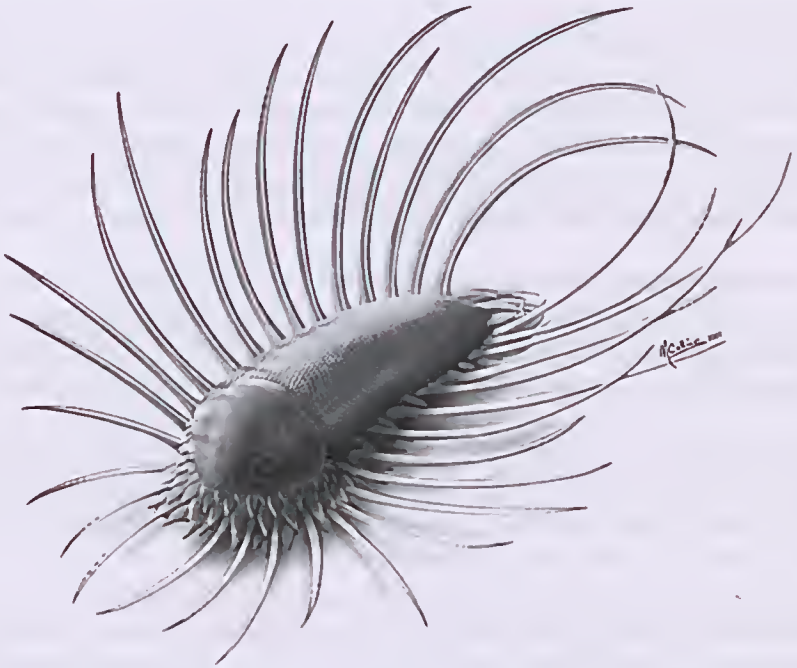
Orthrozanclus was discovered in the well-known Burgess Shale fossil beds in British Columbia. It had no eyes or limbs, and appears to have moved across the ocean bed with a muscular foot. This find throws new evolutionary light on modern day molluscs, such as clams and squids.

It is unusual to find complete fossils of these body-armoured creatures, as they generally only show up as isolated pieces such as spines or bits of shell. Palaeontologists have, until these latest finds, been unable to determine what the complete organism looked like.

Orthrozanclus is believed to have lived on the sea bottom, grazing on bacterial mats. One of the specimens showed a faint impression of a gut, which the scientists speculate the organism filled with sediment from which it would filter out bacteria for food. Its shell and prickly armour of more than 30 long, curved spines would have protected it from predators.

Morris and Caron say *Orthrozanclus* may have formed a link between the Halkieriid and the Wiwaxiid families, uniting them tentatively in a group called Halwaxiida, characterised by a similar type of body armour. These organisms might have been related to modern-day molluscs, or could be linked to the molluscs, annelids and brachiopods.

Information from LiveScience:
http://www.livescience.com/animalworld/070301_hairy_bugs.html
http://en.wikipedia.org/wiki/Orthrozanclus_reburrus



Artist's interpretation of the body-armoured animal *Orthrozanclus reburrus* based on information from fossil specimens (Credit: Marianne Collins, AAAS/Science – 2007).

BOOK AND JOURNAL REVIEWS

PROCEEDINGS OF CAVEPS 2005 edited by L. Reed, S. Bourne, D. Megirian, G. Prideaux, G. Young and A. Wright. *Alcheringa Special Issue* 1, 2006 (475 pp.). AU$120.00. Available from the Geological Society of Australia, Sydney. Telephone (02) 9290 2184 or GSA Bookshop online – www.gsa.org.au/publications

This volume contains 25 papers, the proceedings of the 10th Conference on Australian Vertebrate Evolution, Palaeontology and Systematics (CAVEPS), held at Naracoorte, South Australia from 29 March to 5 April, 2005. Of the 25 papers, 11 cover various aspects of Quarternary extinctions while several deal specifically with the mineralogical, geochemical and taphonomic topics associated with the Naracoorte Caves. Among these papers, four are particularly relevant to the Quarternary megafauna extinction event; the last two days of

the conference being devoted to this specific and important topic.

These are:-

Barry Brooks and Christopher Johnson. Selective hunting of juveniles as a cause of the imperceptible overkill of the Australan Pleistocene megafauna (p. 39-48).

Lyndall Dawson. An ecophysiological approach to the extinction of large marsupial herbivores in middle and late Pleistocene Australia (p. 89-114).

Kirsty Douglas. Skeletons in the cabinet: popular palaeontology and the Pleistocene extinction debate in historical perspective (p. 115-128).

Richard Giillespi, Barry Brook and Alexander BaynesL. Short overlap of human and megafauna in Pleistocene Australia (p. 163-185).

As well as the 25 main papers, there are over 110 abstracts covering a vast range of topics. FCH.

AUSTRALIA'S MAMMAL EXTINCTIONS: A 50,000 Year History by Chris Johnson. Cambridge University Press Australia, 2006 (288 pp.). Paperback AU$49.95. ISBN-10 05221686601.

Of the thirty mammal species known to have vanished in the world in the last 200 years, almost half have been Australian. Our continent has the worst record of mammal extinctions, with over 65 mammal species having vanished in the last 50,000 years. It began with the great wave of megafauna extinctions in the last ice-age, and continues today, with many mammal species vulnerable to extinction. The question of why mammals became extinct, and why so many became extinct in Australia has been debated by experts for over a century and a half and we are no closer to agreement on the causes. This book introduces readers to the great mammal extinction debate. The author, Chris Johnson, takes us on a detective-like tour of these extinctions, uncovering how, why and when they occurred.

Contents: Preface and Acknowledgements; Glossary; 1. Introduction – a brief history of Australian mammals: Part I. Mammals and People in Ice-Age Australia – 2.6 million to 10,000 years ago: 2, The Pleistocene Megafauna; 3, What caused the Megafauna extinctions? 150 years of debate; 4, Two dating problems – human arrival and Megafauna extinction; 5, The changing environment of Late Pleistocene Australia; 6, Testing hypotheses on Megafauna extinction; 7, The aftermath; ecology consequences of Megafauna extinction: Part II. The Late Prehistoric Period – 10,000 to 200 years ago; 8, Environmental change and human history in aboriginal Australia; 9, Dingoes, people, and other mammals in Holocene Australia: Part III. Europeans and their new mammals – the last 200 years; 10, Mammal extinction in European Australia; 11, What caused the recent extinctions?; 12, Interaction: rabbits, sheep and dingoes; 13, Conclusions – the history in review.

Information from Cambridge University Press Australia.

PALAEONTOLOGY VOL. 49(6), 2006

A recent edition of The Palaeontological Association's journal *Palaeontology* includes an interesting paper on Victoria's mammal faunas. Part of the 'Abstract' of this paper is printed below.

"Twenty-two terrestrial and over 20 marine mammal faunas are currently recognized in the fossil record of Victoria, representing one of the most complete records of mammal evolution in Australia. Although the earliest recorded terrestrial mammals come from the Early Cretaceous, the majority of the faunas are concentrated in the Pliocene and Pleistocene, whereas the marine mammal record spans the Late Oligocene-Holocene. Despite the generally fragmentary nature of the fossil remains, many of the faunas are diverse and offer insights into the changes in palaeoecology and palaeoenvironmental conditions in the region over time. Two new diverse mammal sites, Childers Cove and Portland, are a welcome addition to the Pliocene records of both terrestrial and marine mammals. Marine mammal research is only in its early stages, but the Victorian record is fundamental in understanding the evolution of cetaceans in the southern oceans."

An appendix to the paper lists mammalian taxa present in all Cenozoic terrestrial mammal sites discussed in the text as well as a list of sub-families and families Victorian fossil mammal faunas have been discovered in a wide range of localities, from Newmerella (near Orbost) in the east, to Portland in the west. Information about these faunas, found at the following sites across the State, is described in detail in the paper.

MESOZOIC TERRESTRILAL MAMMALS
Cretaceous: Flat Rocks (nr Inverloch), and Dinosaur Cove (Otway Ranges).

CENOZOIC TERRESTRILAL MAMMALS
Oligocene: Waurn Ponds Quarry (Geelong).
Miocene: Batesford Quarry (Geelong), Beaumaris (Port Philip Bay).
Pliocene: Lake Tyers and Bunga Creek (East Gippsland), Portland Pliocene Beds, Forsyth's Bank and Grange Burn (west of Hamilton), Parwan and Boxlea (nr Bacchus Marsh), Coimadai (NE of Bacchus Marsh), Dog Rocks (Batesford, Geelong), Smeaton (north of Ballarat), Childers Cove (nr Warrnambool), Morwell Open Cut Mine, and Great Buninyong Estate Mine (SE of Ballarat).
Pleistocene: Nelson Bay (SW of Portland), Duck Ponds (Lara, nr Geelong), Hines Quarry (SW of Bacchus March) ,and Limeburner's Point (Geelong).

CENOZOIC TERRESTRILAL MAMMALS
Oligocene: Waurn Ponds Quarry (Geelong).
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Pleistocene: Nelson Bay (SW of Portland), Duck Ponds (Lara, nr Geelong), Hines Quarry (SW of Bacchus March) ,and Limeburner's Point (Geelong).

CENOZOIC MARINE MAMMALS
Oligocene: Bells Headland, Bells Beach, Deadman's Gully and Bird Rock (nr Torquay), Waurn Ponds (Geelong), and Castle Cove (Otway Ranges).
Miocene: Newmerella (nr Orbost), Arch Site (Grange Burn, nr Hamilton), Batesford Quarry (Geelong), Curdie (nr Timboon, western Victoria), Gibson's Steps (nr Port Campbell), Hopkins River (nr Warrnambool), Clifton Bank (nr Hamilton), Portland Limestone Cliffs, Beaumaris (Port Philip Bay).
Pliocene: Forsyth's Bank to Fossil Rock Stack (Grange Burn, west of Hamilton), Portland Pliocene Beds, Jemmy's Point and North Arm, Bearlin (Lakes Entrance, East Gippsland), and Trident Arm (Lake Tyers, East Gippsland).

Reference:
Katarzyna, J. A., Fitzgerald, E. M. G. and Rich, T. H., 2006. Mesozoic to Early Quaternary mammal faunas of Victoria, south-east Australia. *Palaeontology* 49(6): 1237-1262.

MEMOIRS OF MUSEUM VICTORIA 63(2), 2006

The Memoir includes a paper on the trilobite fauna of the lower Silurian marine strata of central Victoria. This strata contains a diverse component of 19 species belonging to the families Phacopidae, Dalmanitidae and Acastidae within the Suborder Phacopina. Six new species, two of which are assigned to new genera, are described in the paper. Other species are reviewed or assigned to existing taxa.

Sandford, A. C. and Holoway, D. J., 2006. Early Silurian phacopide trilobites from central Victoria, Australia. *Memoirs of Museum Victoria* 63(2): 215-255

Paper can be viewed at www.museum.vic.govau/memoirs/index.asp

DAWN OF THE DINOSAURS: Life in the Triassic by Nicholas Fraser, illustrated by Doug Henderson. Indiana University Press, 2006 (328 pp.). Hardback AU$ 95.00. ISBN 0253346525. Available through UNIREPS (University of NSW Press) or your local bookshop.

Before the Age of Dinosaurs there was an age in Earth's history known as the Triassic. It was a world of truly fantastic creatures, a genetic stew of the ancient and the modern. During this time the Earth took its first steps toward the creation of modern terrestrial ecosystems. This incredibly exciting period is brought vividly to life in the words of Paleontologist Nicholas Fraser and the consummate artistry of Douglas Henderson. Together they have created a book which the riches of Triassic life are presented with clarity, scientific accuracy, and imaginative recreation. Every lover of life of the past will treasure *Dawn of the Dinosaurs*.

Information from UNIREPS

ALCHERINGA 30(2), 2006 and 31(1), 2007

The first volume contains an interesting paper on the distribution of one of the most prolific trilobites found in the mid-Palaeozoic of central Victoria, the dalmanitid *Dalmanites wondongensis*. A revised diagnosis and redistribution of the species are made possible by the extensive Museum collections.

> **Sandford, A. C., 2006**. Systematics, palaeoenvironments and stratigraphy of the Silurian trilobite Dalmanites wondongensis Gill, 1948 and its bearing on the structural geology of the Kilmore area, Victoria. *Alcheringa* 30(2): 213-232. ISSN 0311-5518.

Amongst the six papers in the second volume is another paper on trilobites. It describes a new species of acastid trilobite, *Acaste andersoni*, from a correlative of the Bell Shale near St Valentines Peak in north-western Tasmania. This discovery "supplements biogeographic links between the Early Devonian faunas of New Zealand, Victoria and Tasmania.

> **Edgecombe, G. D., 2007**. *Acaste* (Trilobita: Phacopina) from the Early Devonian of Tasmania. *Alcheringa* 31(1): 59-66. ISSN 0311-5518.

Copies of Alcheringa are available from the Geological Society of Australia, Sydney. Telephone (02) 9290 2194 or GSA Bookshop online at www.gsa.org.au/publications. From the beginning of 2007 (Volume 31), Alcheringa will be published four times a year.